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E – 3391

Reg. No. : .....

Name : .....

Fourth Semester B.Sc. Degree Examination, July 2018
First Degree Programme Under CBCSS
Physics
Core Course III
PY 1441 : ELECTRODYNAMICS
(2014 Admission Onwards)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer **all**. **Each** carreis **1** mark.

1. What are the divergence and curl of electrostatic field ?
2. Two field lines never intersect, why ?
3. What are the importance of Poisson's equation ?
4. What are polar and non-polar molecules ?
5. State Gauss's theorem in magneto statics.
6. Write the working principle of a cyclotron.
7. What is meant by skin effect ?
8. What is time constant for a LR circuit ?
9. Explain one application of resonance in A.C. circuit.
10. State Norton's theorem.

(10×1=10 Marks)

SECTION – B

Answer **any eight**. **Each** carries **2** marks.

11. During lightening we are safe inside a car, why ?
12. Why electrostatic force is considered as conservative ?

P.T.O.

13. Write down the relation between electric susceptibility and atomic polarisability.

14. What do you mean by dielectric strength ?

15. State and explain Ampere's circuital law.

16. Discuss the importance of the equation $\nabla . \vec{B} = 0$.

17. Explain how Maxwell's equations predict the propagation of E.M. waves through the free space with velocity of light.

18. Explain the term quality factor of a series LCR circuit.

19. What is a choke ? What is its advantage over a pure resistance ?

20. Briefly explain parallel resonant circuit.

21. What is constant voltage source ? How it is realized ?

22. Show that maximum power transfer efficiency is only 50%. **(8×2=16 Marks)**

SECTION – C

Answer **any six**. **Each** carries **4** marks.

23. Check whether the electric field given by $\vec{E} = xy\hat{i} + 2yz\hat{j} + 3xz\hat{k}$ is conservative or not.

24. Find the resultant electric field at a distance Z above the midpoint between two equal charges +q at a distance 'd' apart. Assume Z>>>d.

25. A dielectric slab of thickness 5 mm and dielectric constant 3 is placed between two oppositely charged plates. If the field outside the dielectric is 10^5 V/m. Calculate (1) polarization in the dielectric. (2) electric displacement.

26. A point charge q is situated at a large distance r from a neutral atom of polarisability 'α'. Find the force of attraction between them.

27. A particle of charge 10^{-20}C is moving with a velocity $8 \times 10^6 \hat{i}$ m/s. It enters a region of electric field $10^6 \hat{j}$ V/m and magnetic field $0.2\hat{k}$ T. Find the force on it.

28. A cyclotron has an oscillator frequency of 12×10^6 cycles/sec and a dee radius of 50 cm. What value of magnetic induction B is needed to accelerate protons ?

29. An inductance 500 mH and a resistance 5 Ω are connected in series with an e.m.f. of 20 V. Find the study value of current. If the cell is removed and the terminals are connected together, find the current after 0.3 seconds.

30. Find the resonant frequency in a parallel LC circuit, with inductance having some ohmic resistance.

31. Illustrate how a circuit can be thevenized. **(6×4=24 Marks)**

SECTION – D

Answer **any two**. **Each** carries **15** marks.

32. State Guass's law in electrostatics. Apply this law to find the electric field due to a charged cylindrical conductor of infinite length.

33. State Ampere's circuital law and apply it to find flux density inside a solenoid and toroid.

34. Explain the phenomenon of dielectric polarisation. Find the electric field produced by a uniformly polarized sphere of radius R.

35. Derive an expression for growth and decay of charge in a capacitor through a resistor. **(15×2=30 Marks)**
